

**Apparatus and process for filling containers**

5

**Technical Field**

The invention relates to an apparatus and a process for filling containers with articles. The apparatus and the process are suitable, in particular, for filling  
10 erected containers.

**Background of the invention**

15 Apparatuses for filling containers, in particular erected cartons, with articles are known. Although they allow quick and relatively reliable filling of the containers, most of the apparatuses have the problem that the articles cannot be positioned in an optimally  
20 closely packed manner in the container. If sufficient free space is no longer present, it is barely possible for the final articles to be introduced into the containers.

25 There are various reasons for this, and these reasons depend, in particular, on the type of articles and containers. If, for example, a container is partially filled in another filling station and is then transported to an end filling station, it is possible  
30 for the articles which have been introduced to be displaced during transportation and for the free space which is actually present to become filled. If the containers are to be charged with articles in layers, for example in imbricated form, this inevitably results  
35 in positioning problems in respect of the final articles. It is especially difficult to introduce articles of a second type if the containers have already been filled with articles of a different, first type.

These problems are usually solved in the prior art by the containers having a larger filling space than is effectively necessary. It is desirable, however, to  
5 minimize the container size.

Various apparatuses which erect, and simultaneously fill, folding boxes are also known. For example, DE-A-197,11,415 discloses an apparatus for forming folding  
10 boxes with curved walls. The blanks of the boxes are filled and only then are they glued. The curved shape of the folding boxes is maintained here. DE-A-195,43,719 describes a process in which products are pushed laterally into a partially erected box. Since  
15 the lateral flaps have not yet been folded over, the filling opening is maximized.

US-A-5,060,451 discloses an apparatus for erecting and gluing folding cartons and for filling the same with  
20 ice-cream. Before the filling operation, flaps of the box are swung downwards in order to free the filling opening.

Furthermore, DE-A-32,09,688 discloses a process and an  
25 apparatus for filling and closing garbage containers. The garbage container is a box which is open on one side and which is produced from an elastically deformable material. The box is compressed and filled in this state. Once the box has been filled and a  
30 sealing lid has been positioned on it, the deformation pressure is eliminated. This produces a negative pressure in the interior of the garbage container, and this negative pressure is intended to prevent odors from escaping outwards.

### Summary of the Invention

It is an object of the invention to provide an apparatus and a process which easily allow the  
5 containers to be filled in a closely packed manner. It is a further object of the invention to provide an apparatus and a process which allow already partially filled or already more or less completely filled  
10 containers to be filled in a closely packed manner. It is also an object of the invention to allow filling with at least two types of article.

These objects are achieved by an apparatus and a process having the features of Patent Claims 1 and 12,  
15 respectively.

According to the invention, the apparatus has filling aids which deform containers or form filling guides for these containers. This makes it easier for the final  
20 articles to be introduced into the still remaining or additionally enlarged filling space of the container.

If the container is temporarily deformed before the filling operation, this results in a newly created free  
25 space at a certain location of the container, and this free space can then be used for filling purposes. This improves the positioning operation and/or increases the reliability of the positioning operation. This embodiment is suitable, in particular, for the end  
30 filling of already partially filled containers. Should articles have been displaced during transportation of the container, then the newly created free space allows the container to be filled with further articles.

35 In a first embodiment, the containers are compressed and, in another embodiment, they are drawn apart from one another. The deformation preferably takes place by the filling aids acting in pairs on opposite sides of the container B. The deformation preferably takes place

symmetrically in respect of at least one axis of symmetry.

5 If use is made of filling guides, then at least the final articles are directed into the container along these guides. A preferred embodiment provides guide plates which, in the filling station, rest on at least two opposite sides of each container.

10 The filling guides and the means for deforming the container may also be combined in the same apparatus.

Further advantageous variants of the process and advantageous embodiments can be gathered from the  
15 dependent patent claims.

#### **Brief Description of the Drawing**

20 The subject matter of the invention is explained hereinbelow with reference to preferred exemplary embodiments illustrated in the attached drawing, in which:

25 Figure 1 shows a schematic illustration of the apparatus according to the invention in a first embodiment;

30 Figure 2 shows a view of the detail according to Figure 1;

Figure 3 shows a container according to the first embodiment which has been deformed by means of two carry-along elements;

35 Figure 4 shows a schematic illustration of the apparatus according to the invention in a second embodiment;

Figure 5 shows a filling aid according to the second embodiment;

5 Figure 6 shows a filling aid according to the third embodiment; and

Figure 7 shows a cross section through the filling aid according to Figure 6.

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### **Methods of Implementing the invention**

Figure 1 illustrates a first embodiment of the apparatus according to the invention. Containers B are  
15 fed to a container conveyor 3 on a feed conveyor 1. The conveying direction is illustrated by an arrow. The feed conveyor 1 is preferably a belt conveyor. The containers B are usually transported continuously thereon. It is also possible, however, to use other  
20 conveyors or other methods of feeding the containers B.

The containers B are completed containers in which, once they have been filled, preferably all that is still required is for the filling opening to be closed.  
25 In a preferred embodiment, the containers are erected cartons. The containers B may still be completely empty. It is preferable, however, for them already to be partially filled with articles P1 of a first type. These articles may be, for example, biscuits,  
30 chocolates or else first-packed articles.

The container conveyor 3 transports the containers B to a filling station 6. At least one article conveyor 2 ends in the region of this filling station 6, and  
35 conveys articles P2 to the filling station 6. The articles P2 may be of the same type as the first articles mentioned above. However, as is illustrated here, they may be of a second type, for example a toy.

The filling station 6 contains at least one filling unit 7 in order for the second articles P2 to be filled into the containers B individually or in groups from the article conveyor 2. The filling unit 7 preferably  
5 has a picker, in particular a so-called Delta Robot, and an optical means for detecting the articles.

The now completely filled containers B are transported further by the container conveyor 3 to a removal  
10 conveyor 8, from there they are transferred to further stations (not illustrated here) for further processing, e.g. closing, lidding, stacking or palletizing.

The conveying speeds of the individual conveyors and  
15 the functions of the filling units are controlled by a central control means S. The individual conveyors, in particular the container conveyor 3, may be operated continuously and/or cyclically step by step. It is possible for the containers B to be at a standstill, or  
20 to be transported further, as they are filled.

According to the invention, the containers B are deformed before being filled. In the exemplary embodiment illustrated here, the containers B are  
25 compressed, use being made of the container conveyor 3 for this purpose. It is also possible, however, to use other means. The container conveyor 3 is designed as a so-called LGB/PGX-conveyor, as is described, for example, in EP-A-0,496,046. The container conveyor 3  
30 has carry-along elements 4 which circulate at predetermined spacings. The container conveyor 3 is usually arranged such that it has a top strand 30 and a bottom strand 31.

35 The containers B are pushed onto, or between, these carry-along elements 4 by the feed conveyor 1. As is illustrated in Figure 2, the transfer takes place in the curved region of the container conveyor 3, that is to say in the region of transition from the bottom to

the top strand 30, 31. The opening between adjacent carry-along elements 4 is at its largest in this region.

- 5 As soon as the carry-along elements 4 pass onto the top strands 31, adjacent carry-along elements 4 compress the container B located therebetween and deform it. A correspondingly deformed container B is illustrated in Figure 3. It originally had a rectangular basic shape.
- 10 Now, the container B is curved convexly outward on opposite end surfaces, with the result that a newly fillable free space F is now present on both sides.

For the purpose of deforming the containers B, the

15 carry-along elements 4 have specially shaped, preferably curved deforming surfaces. In the example illustrated here, the carry-along elements 4 are designed as essentially L-shaped accommodation shells. A first sidewall 40, as seen in position on the top

20 strand 30, is oriented horizontally and a second sidewall 41 is oriented vertically. The vertical sidewall 41 has a curved, preferably convex, shape. It preferably has this curvature both on its inner surface and on its outer surface. The containers B are thus

25 clamped in between their front and rear carry-along elements 4, with axially symmetrical deformation being produced in the process. Other types of deformation, however, are also possible. It would thus be possible, for example, for just one surface of the sidewall to be

30 curved or for two carry-along elements 4 to deform in each case just one container B rather than two containers B. It is also not necessary for adjacent carry-along elements 4 to have the same shape. It is also possible to achieve deformation via forces being

35 introduced at at least one of the corners of the container B.

As can be seen in Figure 1, the deformed containers B are brought to the filling station 6, filled there and

then transferred to the removal conveyor 8. The transfer preferably takes place, once again, in the curved region of the container conveyor 3, that is to say in the region in which the top strand 30 passes into the bottom strand 31. During this transfer, the deformation pressure is eliminated and the container B automatically assumes its original shape again. In the case of the re-deformation, in addition, it is possible to utilize the force of gravity in that the containers B which are being released are transferred via obliquely running guide bars, which are fitted laterally in relation to the container conveyor 3, onto the removal conveyor 8, which is arranged at a somewhat lower level.

This embodiment has the advantage that it allows deformation by way of extremely straightforward means, that the containers B need not be stopped in the filling station 6, and that the carrier-along elements 4, depending on the shape of the container B, can be easily exchanged without the rest of the apparatus having to be adapted. It is advantageously possible for the carry-along elements 4 for the container conveyor 3 to perform three functions: accommodating, transporting and deforming containers using just one means.

Figure 4 illustrates a second exemplary embodiment according to the invention. In this case, the containers B are erected cartons with an upwardly directed filling opening and laterally arranged flap L for closing the carton. For this purpose, a support unit 5 is arranged in the region of the filling station 6. The rest of the apparatus corresponds essentially to the arrangement according to Figure 1, it no longer being absolutely necessary for the container conveyor 3 to have carry-along elements with the deforming function. It is not imperative either for the transfer locations between the feed conveyor 1 and the container



3 and between the container conveyor 3 and the removal conveyor 8 to be located in the curved region.

5 The support unit 5, as is illustrated in Figure 5, essentially comprises two vertical supports 50 on which a horizontal support 51 is arranged in a vertically displaceable manner. At least one support frame 53 is retained on the horizontal support 51. A plurality of support frames 53 are usually present in order for it  
10 to be possible for a plurality of cartons B to be filled at the same time. The support frames 53 can preferably be displaced along the horizontal support 51 and fixed in their respective position. Each support frame 53 preferably has a basic shape which corresponds  
15 to the basic shape of the container B which is to be filled but has slightly larger dimensions than the latter. Displaceable spreading elements 54 are arranged on the support frame 53. In this example, the support frame 53 has a rectangular basic shape and the  
20 spreading elements 54 are fastened in a pneumatically displaceable manner at the inner corners of the support frame 53. Each spreading element 54 has a sheet-metal angled member.

25 If containers B which are to be filled are located in the filling station 6, then the horizontal support 51 is lowered until the sheet-metal angled members of the spreading elements 54 are introduced into the region of the inside of the flap L of the carton B. The flaps L  
30 are then swung apart from one another in order to enlarge the filling opening. The pneumatic cylinders serving as actuators of the spreading elements 54 are mounted on the support frame 53 here. Once the container B has been filled, the spreading elements 54  
35 are drawn back again, with the result that the carton B can assume its original shape again. The support frame 53 is raised into its starting position. The individual process steps are likewise coordinated by the control means S.

Figure 6 illustrates a third embodiment. The apparatus corresponds essentially to the apparatus according to Figure 4. However, it has guide plates 52, rather than support frames, which are arranged in this case on the horizontal support 51, the guide plates, in the lowered state, covering over opposite top edges of the containers B which are to be filled, and thus bridging interspaces between the individual containers B. The guide plates 52, as is illustrated in Figure 7, are of curved design and have two legs 52' which project downward and into the containers B. These legs 52' serve as filling guides for filling the containers B with the articles P2.

In the above exemplary embodiment, cartons which have already been erected are preferably being used as the containers. Other types of container, however, are also suitable for use in the apparatus according to the invention and with the process according to the invention. According to the invention, however, use is preferably made of containers in which the filling space has already been completed. Suitable containers are, in particular, those which have a certain reversible flexibility. If flexible deformation is not possible, the original shape can also be actively reproduced. In addition, the containers preferably have a right-angled, planar base surface.

The apparatus according to the invention and the process according to the invention easily allow containers to be completely filled even if the containers have been transported in the partially filled state.

## **List of D signations**

1	Feed conveyor
2	Article conveyor
3	Container conveyor
30	Top strand
31	Bottom strand
4	Carry-along element
40	First sidewall
41	Second sidewall
5	Support unit
50	Vertical support
51	Horizontal support
52	Guide plate
52'	Leg
53	Support frame
54	Spreading elements
6	Filling station
7	Filling unit
8	Removal conveyor
S	Control means
B	Container
L	Flap
F	Free space
P1	Article of the first type
P2	Article of the second type